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THE PAN-PACIFIC ENTOMOLOGIST

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The Pan-Pacific Entomologist

Volume XXX October, 1954 No. 4

CLASSIFICATION OF THE DERMESTID GENUS DEARTHRUS WITH DESCRIPTION OF A NEW WESTERN SPECIES

(Coleoptera)

R. S. Beal, Jr.

Denver, Colorado

Specimens of *Dearthrus* are not at all common in collections, and almost nothing is known of their biology. However, a few of them have been brought to my attention, and a study of these has shed some light on their previously obscure relationships. Although the immature stages are still unknown, the adults seem to exhibit characters which definitely warrant placing the genus in a subfamily different than that to which it is commonly assigned.

The genus seems unquestionably to belong to the subfamily Megatominae rather than to the Attageninae. It has been considered in the Attageninae because of the place assigned to it in Casey's[1] key, where it is grouped with genera having the first metatarsal segment decidely shorter than the second. This is not true of *Dearthrus,* the first segment being subequal to the second. Further, in the shape of the metacoxal lamina it is unlike any representative of the Attageninae which I have seen. In *Attagenus* and in *Novelsis* the metacoxal plate bears a distinct tooth or is distincly broadened laterad to the insertion of the femur. In *Dearthrus,* as in *Megatoma, Trogoderma, Globicornis,* and so on, the metacoxal lamina is gradually narrowed laterally. Finally, the general facies are quite like those of the Megatominane, particularly of certain sections of *Globicornis.* Casey's use of the lateral extension of the metacoxal plates as a tribal character is apparently of little value. In *Dearthrus* the metacoxa reaches the inner posterior angle of the metepimeron. However, this is true of some sections of the Attageninae as well as of the Megatominae. Likewise the number of segments in the antenna is of little significance above a subgeneric level, since this character shows considerable variation throughout the family.

Whether the genus should be synonymized with *Pseudomesalia* Ganglbauer is a question which will have to await a closer study of

[1] T. L. Casey, 1900. Review of the American Corylophidae, Cryptophagidae, Tritomidae, and Dermestidae and other studies. Jour. N. Y. Ent. Soc., 8:144.

the latter. Kalik[2] has recently described a species belonging to this group, *Globicornis (Pseudomesalia) kulti,* including figures of the adult and of the antenna of a specimen which he questionably considers to be a female. The pubescence and configuration of the adult are quite similar to our species of *Dearthrus.* The antenna is nine-segmented and bears a large terminal segment which is much larger than the seventh and eighth segments. The shape of the antenna of *Dearthrus,* and suggests the possibility that these the Megatominae. If the antenna figured by Kalik is indeed that of a female, then *Pseudomesalia* and *Dearthrus* are most likely distinct. However, its configuration does closely resemble the male antenna of *Dearthrus,* and suggests the possibility that these groups are identical.

Dearthrus longulus LeConte of the eastern United States is the only species of the genus known at present. A second species occuring in the inland mountains of California and Oregon should also be recognized. I am happy to be able to name this species for an able student of systematic zoölogy, Dr. Robert C. Stebbins of the University of California at Berkeley.

Dearthrus stebbinsi Beal, new species

Adult male.—Body long and narrow with sides subparallel; elytra slightly expanded behind middle. Color of head and pronotum black; elytra dark brown; undersurfaces dark brown with legs somewhat lighter. *Pubescence* of dorsal surfaces dark brown, short, moderately fine, subrecumbent; pubescence of ventral surfaces dark golden brown, short, fine, appressed. *Punctation* of head and pronotum shallow, umbilicate, with punctures three to four times as large as facets of eye, confluent on head and sides of pronotum, contiguous on disc of pronotum; punctation of elytra craterform with punctures one to two times as large as facets of eye and separated by one to two diameters of one puncture. *Antennae* in repose extending nearly to base of prothorax; configuration as illustrated (except that ultimate segment of holotype two and one-half times as long as wide); ultimate segment of antenna densely clothed with very fine erect hairs about two thirds as long as width of third segment of antenna. *Prosternal process* long, narrow, with sides parallel to apex. Mesosternal sulcus very shallow, becoming evanescent posteriorly; mesosternum emarginate posteriorly between mesocoxae. *Length* (of pronotum and elytra): 2.7 mm. Width (at humeri): 1.1 mm.

Adult female.—Configuration of antenna as illustrated; antennal club more sparsely covered with fine hairs of irregular but generally longer length than those of male.

---

[2] Vladimir Kalik, 1949. New Dermestidae of the Palearctic fauna. Acta Ent. Mus. Nat. Pragae, 26(362):1-4.

Range of observed variations.—Color of elytra and undersurfaces varying from dark brown to black. Ultimate segment of male antenna varying from twice as long as wide to three times as long as wide. Length (of pronotum and elytra) varying from 3.0 mm. to 2.4 mm. Ratio of length to width varying from 1:0.41 to 1:0.47.

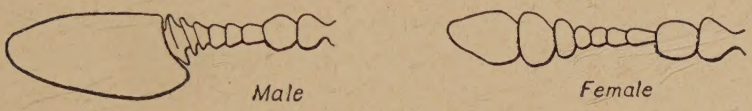

Fig. 1, Antennae of *Dearthrus stebbinsi*

Holotype male and allotype female (deposited in California Academy of Sciences): MARIPOSA COUNTY, CALIFORNIA, June 3, 1914 (F. W. Nunenmacher). Paratypes as follows: *California:* Yosemite Valley, one male, June 5, 1930, and two females, June 9, 1930 (F. E. Blaisdell); Yosemite Park, one male, 1922 (Chas. Veatch); Sierra Meadow, Giant Forest, one male, July 1, 1928 (E. A. McGregor); Tahoe, one female, July 7, 1915 (R. Hopping); Bass Lake, one female, June 3, 1942 (A. J. Walz); Plummer Springs, Trinity County, one female, June 23, 1919 (R. Hopping); Fowlers Camp, Siskiyou County, two females, July 2, 1946 (A. T. McClay); Bridge Camp, Shasta County, one male and two females, June 2, 1946 (A. T. McClay). *Oregon:* Eight miles northwest of Sisters, one female, July 8, 1939 (Schuh and Gray).

The holotype of *stebbinsi* bears two indentations on the disc of the pronotum. Similar indentations have been used as a taxonomic character in other dermestids. However, in this species the indentations occur in only a few of the specimens, and are probably not of genic origin.

D. stebbinsi and *D. longulus* are easily separated on the basis of several characters. The punctures on the disc of the pronotum of *longulus* are small, each puncture being one and one half to two times as large in diameter as a facet of the eye, and individual puntures are separated by one or two diameters of one puncture. In *stebbinsi* the puntures are twice as large and are contiguous. The ultimate segment of the female antenna of *longulus* is approximately three fourths times as long as wide. In *stebbinsi* the ultimate segment of the female antenna is at least one and one third times as long as wide. The ultimate segment of the male

antenna of *longulus*, according to Casey's illustration, is but one and one third times as long as wide. The ultimate segment of the male antenna of *stebbinsi* is two to three times as long as wide. The mesosternal sulcus of *longulus* extends the entire length of the mesosternum and is quite distinct, while that of *stebbinsi* is shallow and obliterated posteriorly.

Details of the biology of *stebbinsi* are unknown, except that one specimen was collected on *Ceanothus* at Bass Lake, California (A. J. Walz).

For material used in this study I wish to express my thanks particularly to W. H. Anderson, P. D. Hurd, Jr., J. N. Knull, H. B. Leech, A. T. McClay, G. E. Wallace, and A. J. Walz.

BOOK NOTICE

FLEAS, FLUKES & CUCKOOS. By Miriam Rothschild and Theresa Clay. 304 pp., 99 black and white photographs (= pls. I–XL), 4 maps, 22 drawings. Collins, St. James Place, London; The Philosophical Library, Inc., 15 East 40th St., New York 16, N. Y. 1952.

The cover title may puzzle some people, but the content will delight every naturalist and most other readers. The exquisite choice of words makes plain sentences stick in one's memory. Statements of fact which might be elsewhere dry, remain accurate yet often become excruciatingly funny. Speculation is clearly noted as such.

The book tells of the parasites of birds, which include fleas, feather lice, protozoa, worms, flies, mites and ticks, and "micro-parasites" (bacteria, viruses, fungi). Discussions of these in the above order, fill chapters 7–13, and comprise most of parts II and III. Part I is introductory, and treats of parasitism, commensalism, symbiosis, the effect of parasites on the host and of parasitism on the parasites, the origins of parasitism, and the evolution of parasites. The final chapters of part III deal with the fauna of birds' nests, the clepto-parasitic skaus, and the parasitic European cuckoo. Throughout there are pointers to unanswered or unexplored problems, both in entomology and in ornithology. There is a general index and one of scientific and popular names. The photographs and line drawings are almost all excellent and have been discriminatingly chosen. The book deserves its rank of a Special Volume in the New Naturalist series.—HUGH B. LEECH.

THE WASPS OF THE GENUS PISONOPSIS FOX

(Hymenoptera: Sphecidae)

FRANCIS X. WILLIAMS

Research Associate, Department of Entomology
California Academy of Sciences

The material studied consists of 93 specimens. Seven of these are from the collection of the United States National Museum and from that of Dr. Karl V. Krombein; 3 are from Dr. G. E. Bohart's collection; 37 from the California Insect Survey, Department of Entomology and Parasitology, University of California; 2 from Mr. P. H. Timberlake; 3 from the California Academy of Sciences; 1 from the American Museum of Natural History; 3 from P. W. Weber of Honolulu; and 37 are of my own collecting. Three species and two subspecies are represented, as follows:

Pisonopsis clypeata Fox. Nevada and California.

Pisonopsis clypeata occidentalis Williams, California.

Pisonopsis birkmanni Rohwer. Texas and California.

Pisonopsis triangularis Ashmead. Colorado, Wyoming, Idaho and California.

Pisonopsis triangularis californicus Williams, California.

The only other species of *Pisonopsis* that appear to be described are:

Pisonopsis anomala Mantero, 1901, Bul. Soc. Ent. Ital., 33:202–203. From Argentina (Patagonia).

Pisonopsis argentinus Schrottky, 1909, An. Soc. Cien, Argentina, 68: 249. From Argentina (Catamarca).

Thanks are due to the above institutions and entomologists for the loan of material, and particularly to Dr. Karl V. Krombein of the United States National Museum for comparing certain of the specimens.

Genus PISONOPSIS Fox

Pisonopsis Fox, 1893, Psyche, 6:553. Genotype, *Pisonopsis clypeata*, from Nevada.

Form stout; mandibles notched beneath, no malar space; eyes moderately emarginate within in female, rather weakly so in the male; interocular space at clypeus usually distinctly greater than at vertex; ocelli round; antennae placed immediately behind clypeus; prepectus present; marginal cell not appendiculate though terminating rather bluntly on costa, not or hardly extending beyond third submarginal cell; second submarginal cell rather short petiolate, usually receiving both recurrent veins; anal lobe of hind wings short, not at all reaching to opposite the apex of submedian cell; legs not strongly spinose; middle tarsi with one apical spur; tarsal claws entire, somewhat inflated basally beneath. Female with or without a margined

pygidial area, and without a tarsal comb. Tergites somewhat constricted apically.

This small American genus is somewhat related to *Pison*, which however, does not have the mandibles notched beneath, while the eyes are deeply notched within, the marginal cell is long and lanceolate and the stigma is longer.

There is a group of tropical American wasps somewhat intermediate between *Pisonopsis* and *Pison*, and of which I have taken two species representing oriental Ecuador, British Guiana and Brazil. Here the eyes are deeply emarginate and the marginal cell as long as in *Pison*, but the mandibles are strongly notched beneath as in *Pisonopsis*.

Little seems to be known about the life history of *Pisonopsis*.

Linsley *et al*[1] report (p. 274) finding four species of wasps of the family Larridae (two species of *Solierella* and two of *Pisonopsis)* appropriating the burrows of the *Diadasia* bee for their nests. These authors state: "One species in particular, *Pisonopsis clypeata* Fox, was very abundant, and females were commonly observed entering both old and new bee burrows. When the first 30 burrows constructed in the square yard area were dug out at the end of the active season, five were found to have larrid provisions in the entrance tube." . . . "The *Pisonopsis* does not alter the original dimensions but accumulates small pebbles and wood fragments to separate its several young." The nature of the prey of these *Pisonopsis* was not determined.

Early in the summer of 1952 the writer reared seven individuals of *Pisonopsis birkmanni* from two lots of cocoons found in small dead stems of poison hemlock *(Conium maculatum* L.) collected during the winter at Danville, Contra Costa County, California. The cells were separated chiefly by grains of soil, and the casks or cocoons much resemble those of *Solierella* save that those of *Pisonopsis* have a somewhat shining resinous appearance instead of being entirely granular, as in *Solierella*. The cask of *Pisonopsis* may be imperfectly enveloped in a loose mantle of soil grains. Remains of crab spiders (Thomisidae) were found in one of these nests.

Later in the summer of 1952 I secured another nest from a

[1] Linsley,, E. G., MacSwain, J. W., and Ray F. Smith, 1952, The Bionomics of Diadasia consociata Timberlake and some biological relationships of Emphorine and Anthophorine bees, U. C. Pub. Ent., 9(3):267-290, plates 1-6.

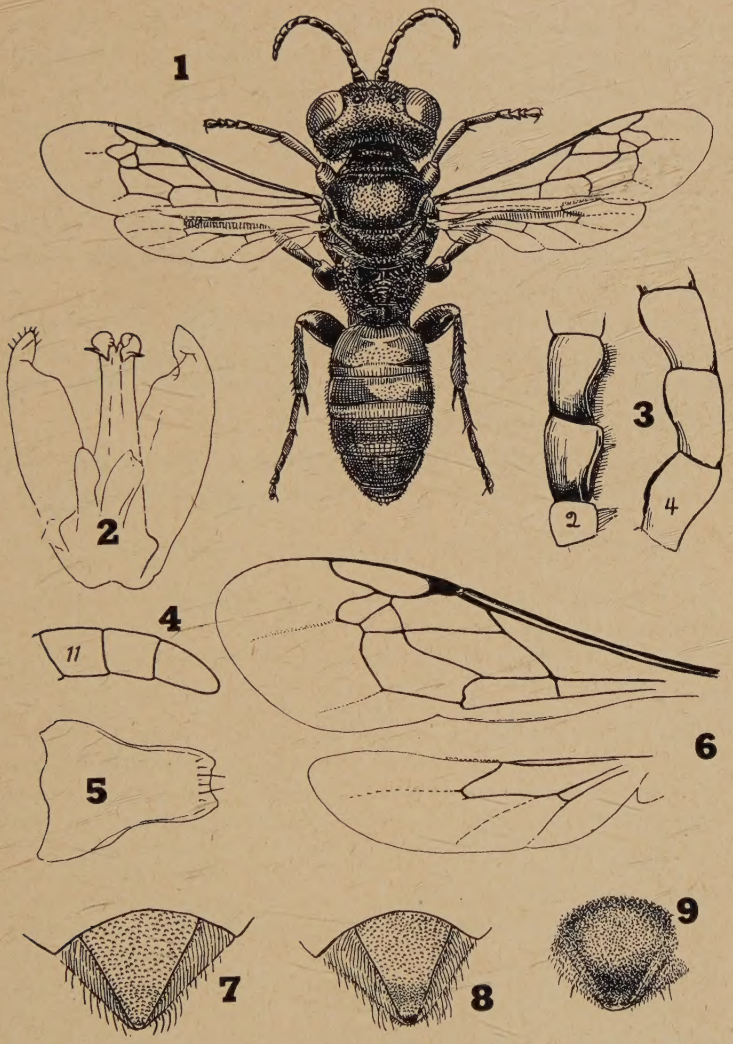

Fig. 1. *Pisonopsis clypeata* subspecies *occidentalis*. Male. Length 6.5 mm. From San Rafael, California. Fig 2. Same. Male. Aedeagus. Fig. 3. Same. Male. Antennal segments 3 and 4 and 4–6. Fig. 5. Same. Male. Last visible ventral segment. Fig. 6. *Pisonopsis triangularis* subspecies *californica*. Male. Fig. 7. *Pisonopsis clypeata*. Female. Pygidium. Gold Lake, Mono County, California. Fig. 8. *Pisonopsis clypeata* subspecies *occidentalis*. Female. Pygidium. San Rafael, Marin County, California. Fig. 9. *Pisonopsis triangularis* subspecies *californica*. To show poorly defined pygidial area. Tassajara Hot Springs, Monterey County, California.

stem of a clump of oats, the stem was cut down to about four and one-half inches from the ground a few days previous. The upper cell was stoppered to the brim as well as separated from the second by considerable quantities of fine soil lumps. It contained 25 generally pallid thomisid spiders, the largest about 3 mm. long. On one of the innermost of these spiders a small wasp larva was feeding. A few days later both cells contained typical *Pisonopsis* casks. Still later in the summer other such nests were found under the same conditions.

During the summer of 1953, several individuals of *Pisonopsis birkmanni* were reared from cocoons found in dead stems of the white sage *(Salvia apiana* Jepson), collected at La Mesa, San Diego County, California.

KEY TO THE SPECIES OF NORTH AMERICAN PISONOPSIS

1 Antennae with 12 segments; abdomen with 6 tergites visible (females) .....2.

– Antennae with 13 segments; abdomen with 7 tergites visible (males) 6

2. Pygidium well defined, margined by a carina; sculpture coarser; abdomen more or less red 3

– Pygidium not or poorly defined, there being no bounding carina; sculpture finer; abdomen black or reddish 4

3. Pygidium broader, forming an angle of about 58°–63° ..... *clypeata* Fox

– Pygidium narrower, forming an angle of about 48° ..... *clypeata* Fox, subspecies *occidentalis* Williams

4. Disc of propodeum with a shining, nearly smooth slightly bossed area on each side of the transversely striated depression, the striae and some strong punctures somewhat invading this bossed area; on sternites 3, 4, and to a less extent on 5, is a pair of slit-like grooves that are best developed laterally, the lamellae nearly joining to form an angle along the middle line (fig. 27); pygidium not at all defined; pronotal lobes pale margined ..... *birkmanni* Rohwer

– Disc of propodeum of a duller and more rugulose appearance, transversely striated over the depressed triangular area, and more finely so across the slightly bossed area on either side, and with no distinct strong punctures invading (fig. 31); sternites 3 and 4 with the grooves becoming weak or disappearing towards the middle line where they tend to form a lobe (fig. 28; pygidial area indicated by a slight dorsal flattening and sometimes by a slight latero-apical compression (fig. 9) 5

5. Sternites 3 and 4 with the grooves extending mesad or nearly, as lines; abdomen often reddish ..... *triangularis* Ashmead

Sternites 3 and 4 with the grooves short, only lateral ..... *triangularis* Ashmead, subspecies *californica* Williams

6. Form stouter, punctures coarser; scutum and scutellum polished, with large separate punctures; abdomen reddish 7

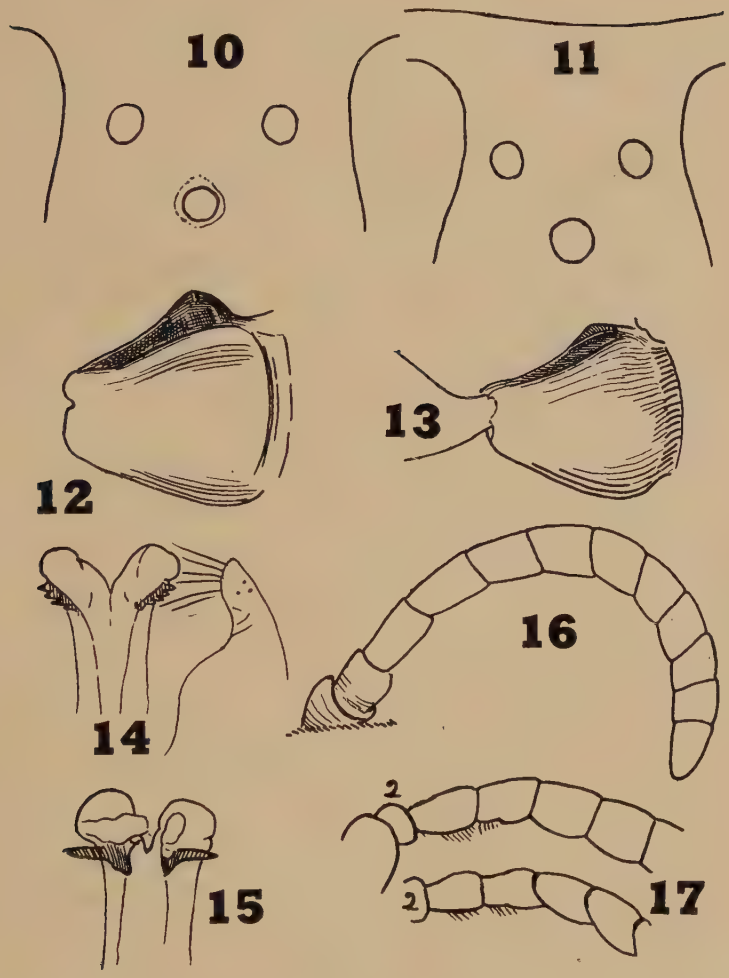

Fig. 10. *Pisonopsis clypeata* subspecies *occidentalis*. Male. Ocelli. Bryson. Monterey County, California. Fig. 11. *Pisonopsis triangularis* subspecies *californica*. Female. Monterey County, California.

Figure 12. *Pisonopsis clypeata*. Female. Posterior coxa, to show carinal lobe. Mono County, California. Fig. 13. *Pisonopsis triangularis* subspecies *californica*. Female. Posterior coxa, to show carinal lobe. Monterey County, California. Fig. 14. *Pisonopsis birkmanni*. Male. Extremity of aedeagus. Menlo Park, California. Fig. 15: *Pisonopsis clypeta*, subspecies *occidentalis*. Male. Extremity of aedeagus. Fig. 16. *Pisonopsis triangularis*, subspecies *californica*. Female. Monterey County, California. Fig. 17. *Pisonopsis triangularis* subspecies *californica*. Male. Antennae, two views. Lassen County, California.

– Form less stout; clypeus always triangularly produced; puncturation finer; scutum and scutellum with punctures on what appears to be in certain lights, a very finely reticulate surface; abdomen black or reddish 8

7. Clypeus triangularly produced or with a gradation slightly indicated (fig. 30) ..... *clypeata* Fox

– Clypeus truncate, with a median tooth (figs. 22, 23) ..... *clypeata* Fox, subspecies *occidentalis* Williams

8. Vertex, and dorsum of thorax with strong close punctures, the punctures behind the ocellar area often not or hardly their own diameter apart; disc of propodeum with the median striated area not much depressed, bordered laterad by a shining though more or less transversely striated area, with few strong punctures invading from the sides; no median carina; slit-like grooves on sternites 3 and 4 forming an angle mesad; pronotal lobes narrowly pale margined ..... *birkmanni* Rohwer

– Vertex and dorsum usually with somewhat finer puncturation, the punctures behind the ocellar area often much more than their diameter apart; disc of propodeum with the median area well depressed and with a carina, the whole glabrous area obliquely and transversely striate; slit-like grooves on sternites 3 and 4 either rudimentary or uniting mesad as a rounded lobe; pronotal lobes entirely black 9

9. The slit-like grooves on sternites 3 and 4 well developed; meeting or nearly meeting at the middle line to form a lobe; abdomen sometimes partly red ..... *triangularis* Ashmead

– The slit-like grooves poorly developed, short and far laterad, present on sternite 3, or 3 and 4 ..... *triangularis* Ashmead, subspecies *californica* Williams

PISONOPSIS CLYPEATA FOX

(Figures 7, 12, 19, 30, 32)

Fox, 1893, Psyche, 6:553–554. Male and female. Nevada (Morrison).

Female: Length 9 mm. Stout, rather coarsely sculptured, shining. Black; abdomen rufous. Clypeus drawn out wedge-like. Strong distinct punctures on head and dorsulum; disc of propodeum with a somewhat triangular enclosure, obliquely striate on basal portion, transversely so on apical portion. Pygidial area triangular, well margined and with strong punctures. Pile silvery.

Male: Length 7 mm. Much like the female, but segments 1–6 of the flagellum of the antennae produced beneath; the clypeus is produced wedge-like but with an indication of gradation (fig. 30). Pygidium densely though rather irregularly rugulosely punctuate; last visible ventral segment rather broadly excavate. Pile silvery.

Through the kindness of Mr. J. A. G. Rehn, of the Academy of Natural Sciences of Philadelphia, I was able to study a male and a femal of the type series. I have also seen a single female from Gold Lake, Sierra County, California, collected August 2, 1921, by C. L. Fox (California Academy of Sciences). The pygidium

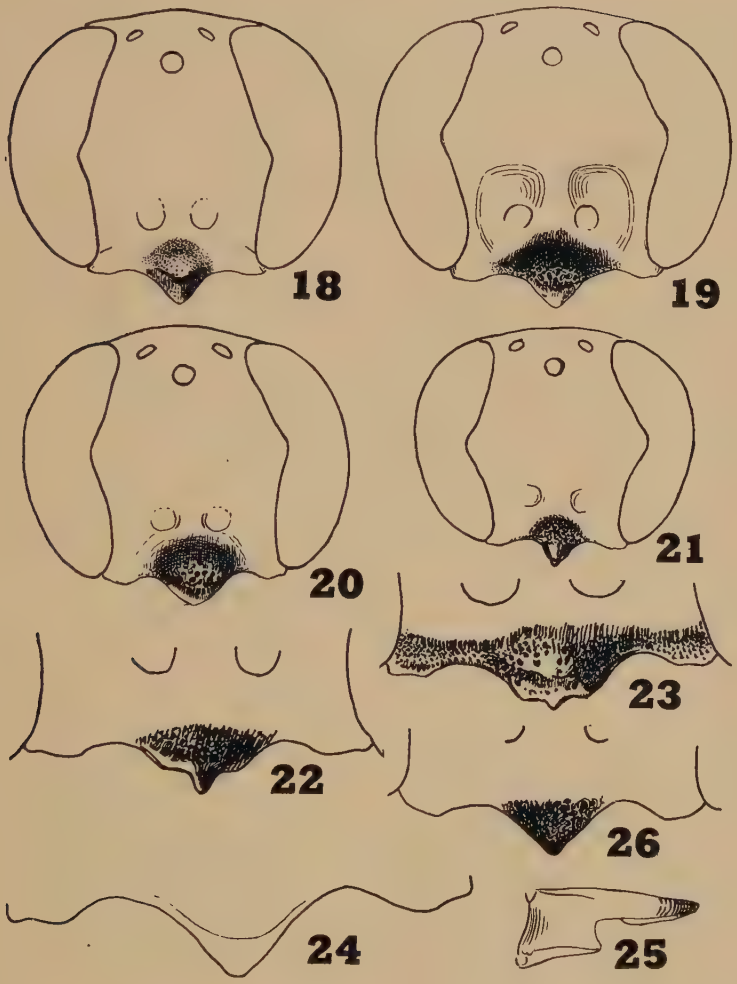

Fig. 18. *Pisonopsis triangularis* subspecies *californica*. Female. Monterey County, California. Fig. 19. *Pisonopsis clypeata*. Female. Mono County, California. Fig. 20. *Pisonopsis clypeata*, subspecies *occidentalis*. Female. San Rafael, California. Fig. 21. *Pisonopsis birkmanni*. Female. San Mateo, County, California. Fig. 22. *Pisonopsis clypeata*, subspecies *occidentalis*. Male. San Rafael, California. Fig. 23. Same. Male. Bryson, Monterey County, California. Fig. 24. *Pisonopsis triangularis*, subspecies *californica*. Female. Clypeal outline. Mt. Lassen, California. Fig. 25. Same. Female. Mandible, outer side. Fig. 26. *Pisonopsis clypeata*, subspecies *occidentalis*. Female. Clypeus unworn. Near Palm Springs, California.

and head are shown (figs 7 and 19, respectively); this specimen, however, has the pygidium narrower than in the type (fig. 32), and thus approaching that of its subspecies (fig. 8).

Pisonopsis clypeata occidentalis Williams, new subspecies

(Figures 1–5, 8, 10, 15, 20, 22, 23, 26, 29)

Female, holotype: Length 7.75 mm. Black, moderately shining, strongly punctate and sculptured, the two basal joints of the antennae in part, and the apical half of the mandibles reddish brown, hind margin of pronotal lobes whitish, tegulae, axillary sclerites and base of wings more or less brownish, abdomen orange red, the somewhat apical margin of the segments testaceous. Clypeus produced subconic, the disc subconvex, not carinate, with coarse punctures before the smooth depressed apical portion; antennae rather slender, segments 3 and 4 subequal; frons very densely punctate-granulate; vertex with strong close punctures; interocular space at vertex about .70 of its narrowest width at clypeus and about equalling antennal segments 2 plus 3 plus 4; ocelli forming nearly a right angle triangle; a depressed line from anterior ocellus to about abreast of the ocular emargination. Scutum, mesopleura and scutellum with strong separate punctures; postscutellum fine, very close ones; propodeum with an inbowed triangular depression with a median carina and well-spaced oblique and transverse carinulae, the rounded ridges laterad transversely striate; laterad of these ridges granulate, the pleura with strong horizontal striae, the posterior face striato-granulate and with a median groove. Posterior coxae with a rounded ridge on inner side above near base. Second submarginal cell receiving both recurrent veins. Abdomen with strong separate punctures; pygidium with the lateral carinae sharp, the disc with fine close punctures and somewhat depressed and constricted beyond middle length. Vestiture rather sparse silvery pile.

Male, allotype: Length 7 mm. In general resembling the female, but the apical half of the abdomen, except for the testaceous margin of the segments, is blackish. The clypeus is subtruncate, with a median tooth, its disc closely punctate; antennae with segments 3–6 nearly equal, segments 3 and 4 excavate beneath and somewhat inwardly at base and there polished and with fine erect pile; segments 4–9 beneath and somewhat outwardly, produced so as to give that section a more or less spirally crenulate appearance. Interocular space at vertex relatively broad, about .80 of the space near the clypeus and slightly greater than antennal segments 2 plus 3 plus 4. Pygidial area flat, not margined, densely punctuate.

Holotype female and *allotype* male (California Academy of Sciences): SAN RAFAEL, MARIN COUNTY, CALIFORNIA, July, 1922 (F. X. Williams), on ground among dry leaves at edge of thicket. Paratypes: 1 female and 10 males, San Rafael and nearby, July 16 and 22, 1922 (F. X. Williams); 1 male, Bryson, Monterey County, California, May 18, 1920 (E. P. Van Duzee) (Collection California Academy of Sciences); 1 female near Palm Springs, Riverside County, June 8, 1930 (P. H. Timberlake), on *Eriogonum*

trichopodum; other specimens: 11 females and 22 males, Tracy, San Joaquin County, end of May, in June, and August 1, 1949 (J. W. MacSwain, R. F. Smith and P. D. Hurd); 1 male, Tanbark

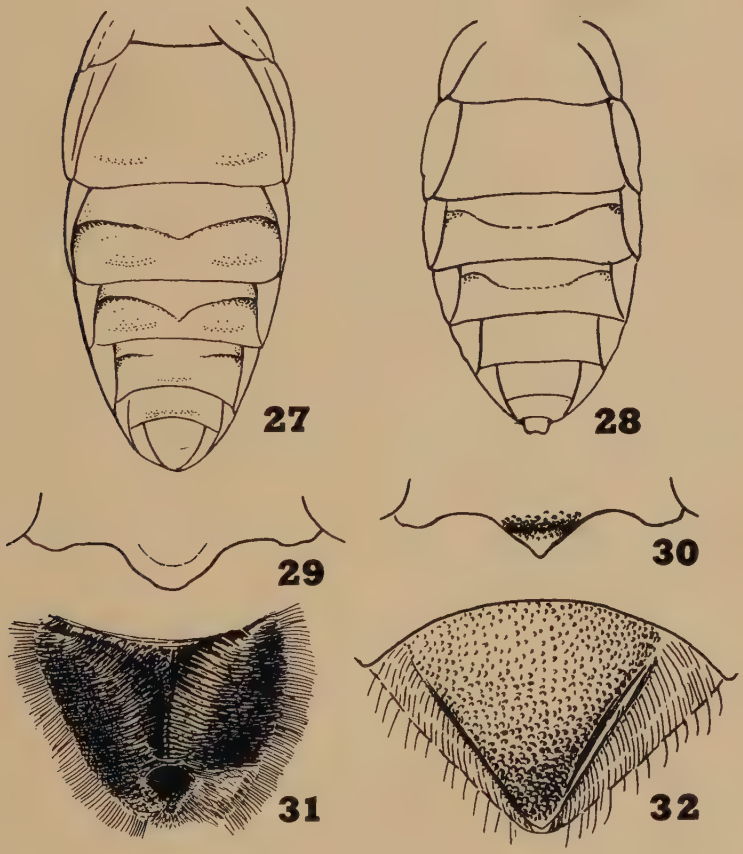

Fig. 27, *Pisonopsis birkmanni.* Male. To show grooves on sternites 3–5. Williamson County, Texas. Fig. 28. *Pisonopsis triangularis.* Male. To show grooves on sternites 3 and 4. Green River, Wyoming. Fig. 29. *Pisonopsis clypeata,* subspecies *occidentalis.* Female, Clypeus, unworn but not the usual type. Tracy, California. Fig. 30. *Pisonopsis clypeata.* Male. Allotype. Clypeus. Nevada. Fig. 31. *Pisonopsis triangularis,* subspecies *californica.* Female type. Disc of propodeum. Summit Lake, Mt. Lassen, California. Fig. 32. *Pisonopsis clypeata.* Paratype female. Pygidium. Nevada.

Flat, San Gabriel Mountains, California, June 25, 1950 (F. X. Williams).

This subspecies differs from typical *P. clypeata* Fox by the narrower pygidium of the female, and by the distinctly truncate and toothed clypeus (with slight variations) in the male.

The female paratype and all the males have the apex of the abdomen blackish.

PISONOPSIS BIRKMANNI Rohwer

(Figures 14, 21, 27)

Rohwer, 1909, Trans. Amer. Ent. Soc., 35:129. Female. Lee County, Texas, (Birkmann).

Descriptions based on California specimens: *Female:* Length 6 mm. Black; head and thorax subopaque, disc of propodeum with a shining area each side of the median sulcation; mandibles reddish on apical half, pronotal lobes white to pale brownish apically. Clypeus with the convex basal part coarsely punctate, particularly at the origin of the smooth produced median portion which forms a wedge which is slightly shouldered not far far from the apex; antennae short, segment 4 slightly longer than 3; front and vertex opaque, finely reticulate and granulate-punctate; ocelli forming a right angle triangle; interocular space at vertex little if any narrower than at clypeus. Dorsulum appearing reticulate and with rather fine strong punctures, sparser on scutellum. Disc of propodeum with an inbowed, somewhat trianguler depressed area, its median carina not strong, the fine oblique carinulae becoming transverse at apex of disc; a finely reticulate shining strip on either side on disc, with strong, well-separated punctures invading from the striato-punctate area of most of the pleura and posterior face; the posterior face has on inverted, narrowly tear-shaped trench; posterior coxae with a rounded basal lobe. Abdomen with strong punctures, finer on apical segments, the apical margin of the sternites more or less testaceous; pygidium not margined, the area finely and closely punctate; sternites more finely punctate; pile silvery.

Male: Length 5.25 mm. About like the female. Clypeal tooth acute; antennal segments 3 and 4 subventrally excavate at base, this area brown and shining, while dorsally there is some fine erect pile; antennal segment 5 somewhat longer than 4, segments 4–9 outwardly convex so as to give that section a somewhat crenulate effect. Disc of propodeum with the transverse carinulae more extensively invading the nearly smooth area on either side; median carina obsolescent. First recurrent vein received at tip of first submarginal cell.

One female and 2 males, Menlo Park, San Mateo County, California, July 1937 (F. X. Williams); 1 male, Searsville Lake, San Mateto County, June 29, 1937 (F. X. Williams); 6 females and 3 males, Danville, and 1 female, Mt. Diablo, Contra Costa County, California, June—August, 1949 (F. X. Williams); 2 males, Tanbark Flat, San Gabriel Mts., California, July 8, 1950 (F. X. Williams); 2 males and 2 females, La Mesa, San Diego County, Summer of 1953 (F. X. Williams); 1 male and 1 female, Davis, Yolo County,

California, August 24, 1939 (G. E. Bohart); 1 female, Box Canyon, Riverside County, California, April 13, 1934, on *Chilopsidis linearis* (Orobanchaceae), (P. H. Timberlake); 2 females and 1 male, Riverside, September 21, 24, 26, 1948, "feeding at exudations of Opuntia plants" (P. W. Weber). Other specimens seen: From the United States National Museum and the Krombein collection, 1 female, Brazos County, Texas, July 25, 1937 (J. E. Gillaspy), "on corn." (Dr. Krombein kindly compared this specimen with the type); 1 male, Williamson County, Texas, April 23, 1935 (J. E. Gillaspy); 1 female, La Crescenta, Los Angeles County, California (R. M. and G. E. Bohart), this last specimen not being typical.

This species varies somewhat in sculpture and venation.

PISONOPSIS TRIANGULARIS Ashmead

Ashmead, 1899, Ent. News, 10:9. Female. "Hab. Colorado. Carl C. Baker Collection, No. 2061. Type, No. 5064, U.S.N.M."

The type is 6 mm. long, rather opaque, and closely punctate. The clypeus has a median triangular production, and the disc of the propodeum is transversely striate, and rugulose. The sinuate slit-like grooves on sternites 3 and 4 extend nearly or quite to the median line to form a rounded lobe. The male much resembles the female; the clypeus has a smooth acuminate point, while the antennal modifications resemble those of its subspecies, *Pisonopsis triangularis californica* (fig. 17) that follows. Figure 28 is from a male specimen from Green River, Wyoming (4747:American Museum of Natural History). Other specimens are: 1 male, Tracy, San Joaquin County, California, May 31, 1949 (J. W. MacSwain); 1 female and 6 males, Tanbark Flat, San Gabriel Mountains, California, 2700 ft., end of June to early July, 1950 (F. X. Williams). The California specimens have the abdomen largely reddish.

Pisonopsis triangularis californica Williams, new species

(Figures 6, 9, 11, 13, 16, 17, 18, 24, 31)

Female, holotype: length 6.75 mm. Black, moderately shining, frons subopaque; puncturation fine and close; mandibles reddish, subapically; depressed apices of tergites in part testaceous; calcariae brownish to black. Clypeus with the anterior part of the convex disc with rather large, well-spaced punctures, the triangular projection smooth; frons finely and closely punctate; antennal segments 3 and 4 subequal; interocular space at vertex less than at clypeus; ocelli in less than a right-angle triangle. Dorsum finely and closely punctate; scutum with a shallow median groove. Disc of propodeum shining, the depressed triangular area inbowed, the slope of the depression gradual, the oblique carinulae well spaced, fanning at base and becoming transverse and more crowded towards the apex, these carinulae breaking up towards the pile, the pleura are striato-punctate and the posterior face rugulose and with a smooth subtriangular fovea. Second recurrent vein barely within the second submarginal cell. Abdomen with fine piliferous punctures;

pygidial area feebly indicated by a dorsal flattening and slightly compressed apical sides; sternites 3 and 4 with the slit-like pockets lateral only, indicated by a fine curved linear groove.

Male, allotype: Length 5.5 mm. Resembling the female in most points. The clypeus is more sharply pointed, and the rather stout antennae (somewhat less modified than in *Pisonopsis birkmanni)* have segments 3 particularly, and 4 smooth and constricted for nearly the basal half, with segment 4 notched dorso-laterad, and segments 5 to 8 in a diminishing degree outwardly rounded beneath.

Holotype female, *allotype* male, one female and 1 male paratype, SUMMIT LAKE, LASSEN COUNTY, CALIFORNIA, 6700 ft., July 21, 1937 (F. X. Williams). In good condition. Other paratypes: 1 female, Tassajara Hot Springs, Monterey County, California, May 18, 1920 (L. S. Slevin) (C.A.S.); 1 female, Mammoth Lake, Mono County, California, July 25, 1936 (R. M. & G. E. Bohart), these two specimens having the abdomen somewhat reddish.

This rather weak and variable subspecies differs from *Pisonopsis triangularis* chiefly in the less developed grooves on sternites 3 and 4, and sometimes in its more closely aligned carinulae in the somewhat less sharply depressed propodeal enclosure.

I am indebted to Dr. Karl V. Krombein for comparing a female topotype of this subspecies with the type of *Pisonopsis triangularis* in the United States National Museum.

BOOK NOTICE

THE TAXONOMY, PHASES, AND DISTRIBUTION OF THE GENERA CHORTOICETES BRUNN. AND AUSTROICETES UV. (Orthoptera: Acrididae). By K. H. L. Key. 237 pp., 40 figs., 45 tables. Offset. Division of Entomology, Commonwealth Scientific and Industrial Research Organization, Australia. Canberra, May 1954. (Order from C. S. & I. R. Organization, 314 Albert St., East Melbourne, C.2.)

The genera *Chortoicetes* and *Austroicetes* include the chief injurious Acrididae of southern Australia. This paper is a detailed taxonomic study of the adult grasshoppers, based on very large series, with the results of many years of field work to aid in interpreting the tremendous infraspecific variation. Much of the resulting data are given statistical treatment. Three new species are described, and Latinized names proposed for 11 new forms (homologous-genetic variations). " . . . subspecies are recognized only where the population of a significant geographical region is homogeneous for a particular character or character complex, which serves to differentiate every member of that population from the members of other populations similarly homogeneous for some other character or character complex. The question is discussed in greater detail in Section III 2 (d)."—HUGH B. LEECH

THE DIPTERA COLLECTED ON THE COCKERELL AND HUBBELL EXPEDITIONS TO HONDURAS Part III: TYLIDAE, WITH A NEW SPECIES FROM MEXICO[1]

Maurice T. James

State College of Washington, Pullman

The present paper lists the Tylidae (=Micropezidae) in the broad sense, including the Taeniapterinae and Neriinae, of the Cockerell and Hubbell Honduras collections. No Trepidariinae (=Calobatinae) were encountered. An extralimital species, from Mexico, is included for want of a better place to describe it.

Taeniaptera lasciva (Fabricius), 1798, Entomologia Systematica, Suppl., p. 564 (Musca). Escuela Agricola, Zamorano: Nov. 20, 1946 (Pelen), 1 female; Nov. 24, 1946 (W. P. Cockerell), 1 female; Dec. 27, 1946 (T. D. A. & W. P. Cockerell), 1 male, 2 females; Oct., 1946 (Cisneros), 1 male; Aug. 19, 1948, reared sweet potato, #236 (Hubbell), 15 specimens; July 9, 1948, tall weeds, #45 (Hubbell), 1 male, 1 female; July 1, 1948, roadside, #10 (Hubbell), 1 female; July 19, 1948, weed thicket, #106 (Hubbell), 1 female; July 16, 1948 (Hubbell), 1 male. Rio Claura, April 13, 1923, #259 (Hubbell), 1 female.

Taeniaptera latitibia (Enderlein) 1922, Arch. für Naturgesch., 88 (A,5), p. 220 *(Grallomyia)*. Tela, Lancetilla, July 28, 1948 (Hubbell), 1 male.

Tylos (Neriocephalus) stigmaticus (van der Wulp), 1897, Biologia Centrali-Americana, 2, p. 366 *(Micropeza)*. Escuela Agricola, Zamorano: Nov. 25, 1946 (W. P. Cockerell), 1 male; on bean, July 19, 1948, #107 (Hubbell), 1 female; meadow, Yeguare River, July 2, 1948, #18 (Hubbell), 1 male; roadside, July 1, 1948, #10 (Hubbell), 1 male, 1 female; July 15, 1948, #77, (Hubbell), 1 male; on gardenia, July 4, 1948, #25 (Hubbell), 2 males.

Tylos abbreviatus (Cresson), 1926, Trans. Amer. Ent. Soc., 52, p. 262 *(Micropeza)*. Escuela Agricola, Zamorano: weed thicket July 19, 1948, #106 (Hubbell), 3 males, 2 females: roadside, July 1, 1948, #10, 1 male, 2 females; vegetables, July 1, 1948, #13 (Hubbell), 1 male, 3 females; campus, Aug. 16, 1948, #224 (Hub-

[1] For Part I of this series, see Pan-Pac. Ent., 26 (2): 86 - 90, 1950; for Part II, see Jour. Washington Acad. Sci., 43 (2):46-57, 1953.

bell), 2 females; tall weeds, July 9, 1948, #45 (Hubbell), 2 males, 1 female; on gardenia, July 4, 1948, #25 (Hubbell), 1 female.

Tylos tabernilla (Cresson), 1926, Trans. Amer. Ent. Soc., 52, p. 263 *(Micropeza)*. Escuela Agricola, Zamorano: tall weeds, July 9, 1948, #15 (Hubbell), 1 female; weed thicket, July 19, 1948, #106 (Hubbell) 1 female.

Tylos (Neriocephalus) sufflavus James, new species

This species traces to paragraph 42 or 45 in Hennig's (1936, p. 140) key (the first posterior cell being either closed in the costa or short-petiolate) but will not run satisfactorily beyond those points. The pleura are entirely yellow, at most discolored with yellowish brown but without clearly-marked patches of that color, and contrasting with the black mesonotum; all femora are yellow, at most with their apices slightly discolored; the claspers of the male are exceptionally large; and the ovipositor in the female is exceptionally broadened and angulate apically on the non-retractile portion, being as broad there as the greatest width of the abdominal terga.

Male.—Head moderately elongated, about 0.75 as high as long, the eyes equal in length and height. Vertex and upper half of occiput, including orbits, shining black; front between eyes orange-yellow, between posterior margin of eyes and anterior ocellus reddish yellow, with an extension of this area passing to each side of the ocellar triangle, first broadly, then narrowing to a fine stripe that passes between the inner and outer verticals and terminates on the occiput; front from eyes to bases of antennae reddish brown. Face and lower part of occiput, except a small brownish area behind the lower posterior corner of the eye, yellow. Pile of head very inconspicuous; facial orbits silvery-tomentose. Inner vertical, outer vertical, and postvertical bristles strong, black. Antenna reddish yellow; setulae of first and second segments black; arista black, bare. Proboscis and palpi yellow. *Mesonotum* including scutellum, and metanotum, black, at most slightly reddish along the notopleural suture and on the postalar regions, subshining, dulled by a cinereous pollen which becomes more or less brownish laterally. Prothorax mostly yellow, pronotum and humeri reddish brown. Pleura yellow, at most with areas on the mesopleura and pteropleura reddish brown. Upper parts of pleura shining, the lower parts, especially of the sternopleura, whitish-pollinose. Two strong notopleurals, 1 sternopleural, and several bristles on the lower parts of the sternopleura before the middle coxae, black. Scutellars strong, black. Wing slightly brownish-hyaline; apical cell closed in the margin or short-petiolate; costal section between R_{2+3} and R_{4+5} less than half the length of M_{1+2} (ratio about 30 to 65 or 70). Halteres yellow, knobs brownish. Coxae yellow with black setulae and bristles; femora and tibiae reddish yellow, without any trace of annuli but with the tibiae becoming brownish at the apices, the fore pair sometimes mostly brownish; tarsi

brownish, the terminal tarsomeres somewhat enlarged. *Abdominal terga* I to VI black with narrow lateral margins on all segments and broader, complete apical margins on II to VI, sometimes becoming obscure on IV and V; pollen as on the mesonotum. Epandrium dorsally and extremities of surstyli reddish yellow, the ventral areas, including the sternites and the copulatory claspers, yellow. Claspers large, almost as long as the first three terga combined, ovate, broadest at three-fifths their length, from the lateral aspect angulate apically, from the ventral (anterior) aspect incised, V-shaped, to almost one-third distance from the apex; surstyli cruciate, the right overlying the left, each with a broadly acute apex. Length, 8–9 mm.

Female.—Similar to the male, except sexually. Apical tarsomeres not enlarged. Basal (non-retractile) part of ovipositor reddish-brown dorsally, narrowed at base to apical width of sixth tergum, then becoming broader to its apex and definitely angular at its outer corners; the retracile part yellowish and narrowing strongly but gradually to the subcylindrical, blackish apical portion. Comparative measurements (30=1 mm.): non-retractile part of ovipositor, base 23, apex 33, length 20–25; basal width of subcylindrical terminal part, 8; maximum width of abdomen (apex of tergum III), 33; apex of tergum VI, 23.

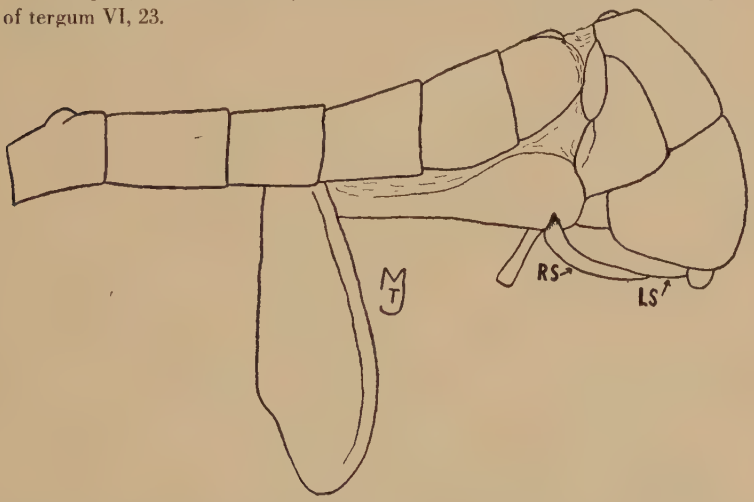

Fig. 1. *Tylos sufflavus*, new species. Abdomen of male, lateral view, left side, from a paratype. RS, right surstylus; LS, left surstylus.

Holotype male, MT. TANCITURO, MICHOACAN, MEXICO, 7800 ft., sweeping in mountain meadow (H. Hoogstraal), Fourth Hoogstraal Mexican Biological Expedition, 1941. *Allotype*, same data but on lupine, mountain meadow (Mt. Tancituro?). Paratypes, 4 males, 8 females, same data as holotype and allotype. Holotype and allotype in the Chicago Natural History Museum.

I have seen a pair of specimens in the collection of the Chicago

Natural History Museum from Mt. Tancituro, in field, Fourth Hoogstraal Mexican Biological Collection, which may be *T pectoralis* (Wiedemann) (=*T. occipitalis* Van der Wulp, according to Hennig and Aczél). These specimens are smaller (6 mm.), the mesopleura and pteropleura are marked with definite reddish brown patches, the occiput is more broadly black in the middle, the basal part of the ovipositor is almost parallel-sided and blackish dorsally, and the epandrium is marked with black dorsally. The male genitalia are essentially as in *sufflavus*. If my identification of *pectoralis* is correct, this species is very close to *sufflavus*. Both Wiedemann's and Van der Wulp's species were described from females only.

Oncopsia flavifrons (Bigot), 1886, Ann. Soc. Ent. France, (6) 6, p. 372 *(Nerius)*. Tela: Lancetilla, July 28, 1948 (Hubbell), 2 females.

Glyphidops filosus (Fabricius), 1805, Systema Antliatarum, p. 265. *(Nerius). Tela:* Lancetilla, July 28, 1948 (Hubbell), 1 female.

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FIRST REPORT OF TRICHOCORIXA CALVA (SAY) FROM MEXICO

(Hemiptera:Corixidae)

A single, male corixid, kindly identified by Dr. R. I. Sailer as *Trichocorixa calva* (Say), was taken from a small, roadside pond three miles north of El Mayor, Baja California, Mexico, October 6, 1953, by R. D. Lee, R. E. Ryckman, and C. T. Ames. Sailer[1] noted previous collections from 27 states and the District of Columbia in the United States, but it is believed that this is the first record for the collection of *T. calva* in Mexico. The specimen is now in the collection of the California Academy of Sciences.—ROBERT D. LEE, *School of Tropical and Preventive Medicine, Loma Linda, California.*

[1] Sailer, R. I., 1948. The genus **Trichocorixa** (Coreidae, Hemiptera). Univ. Kansas Sci. Bull. 32: 289-407.

UTILIZATION OF HYDROPONICS IN ECOLOGICAL STUDIES OF THE COTTON APHID

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The possibility of utilizing hydroponics in the investigations of sucking insects offers a great deal of promise. The present writer used this method in Brazil to excellent advantage during 1950 and 1951 in conducting a study of the coffee soft green scale, *Coccus viridis* (Green). The growing of host plants in nutrient solutions can be easily conducted in the laboratory, and has several advantages over growing plants in pots. The principal one is that it is possible to remove the plants for short periods of time from the nutrient solution in order to examine insect activity under a binocular microscope.

Isily (1946) in studying the influence of nitrogen and potassium on the behavior of the cotton aphid used nutrient solutions to irrigate plants growing in sand. The same method was used by Barker and Tauber (1951) in their study of the effect of nutritional changes on the development of the green peach aphid, *Myzus persicae* (Sulz.) and the pea aphid, *Macrosiphum pisi* (Kalt.). Hydroponics has been used by Metcalf and Carlson (1950), David (1951) and Metcalf and March (1952) in investigations involving systemic insecticides.

In the present study, the cotton or melon aphid, *Aphis gossypii* Glover was selected because of its great economic importance in Brazil, the author's homeland. Although a number of crops are seriously injured, it is most destructive to cotton. The latter may be heavily attacked during any stage of growth. Seedling stands are frequently completely destroyed, and older plants may be deformed, covered with honeydew and blackened with the growth of the sooty mold fungus.

EXPERIMENTAL METHODS

The nutrient solution used was obtained from Hoagland and Arnon (1950) and its composition was as follows:

[1] Investigation was conducted at the University of California, Berkeley, under a Fellowship granted by the Rockefeller Foundation.

Stock Solution	Ml used per liter to make nutrient solution
1 M. potassium acid phosphate, KH_2PO_4	1
1 M. potassium nitrate, KNO_3	5
1 M. calcium nitrate, $Ca(NO_3)_2$	5
1 M. magnesium sulfate, $MgSO_4$	2

To furnish the needed micro elements 1 ml of the following stock solution was added to the above nutrient solution.

Chemical Compound	Grams dissolved in 1 liter of stock solution
boric acid, H_3BO_3	2.86
manganese chloride, $MnCl_2.4H_2O$	1.81
zinc sulfate, $ZnSO_4.7H_2O$	0.22
copper sulfate, $CuSO_4.5H_2O$	0.08
molybdic acid, $H_2MoO_4H_2O$ (assaying 85% MoO_3	0.02

Depending upon the size of plants desired, glass containers ranging in size from 2 ounces to ½ gallon were used. In order to discourage the growth of algae, the outside of the containers was painted black, and then wrapped in paper or painted white or aluminum to reflect heat.

The nutrient solutions were changed periodically because according to Hoagland and Arnon (1950) plants "absorb the nutrient salts, thus causing the acidity of the solution to change." Although there are methods for correcting the acidity, the above authors stated that the situation can be taken care of by changing the solutions every week or two.

Although plants grow best where the nutrient solution is continuously aerated, it was found in the present experiments that satisfactory growth was obtained by aerating the cultures once a day with a syringe. However, one experiment was conducted in a greenhouse where continuous aeration was used.

Many kinds of plants were used. These included cucumber, Crenshaw melon, honeydew melon, cantaloupe, pumpkin, squash, and cotton. Although all of them grew well, squash appeared to be the best suited for the present investigation.

Seeds were germinated in sand or sawdust, and the same day they germinated they were transferred to the nutrient solution. The seedlings were passed through holes in the cork stoppers and held in place with cotton packing. The plants were ready for use

as soon as the cotyledons reached a size where they could be utilized.

Cages for rearing were 10 mm. in height and from 15 to 20 mm. in diameter and were made of clear transparent plastic or glass tubing. They were covered with cheesecloth or with either 40 or 60 gauge nylon, which was cemented on with Duco cement. The cells were placed on the upper surface of the leaves with a thin

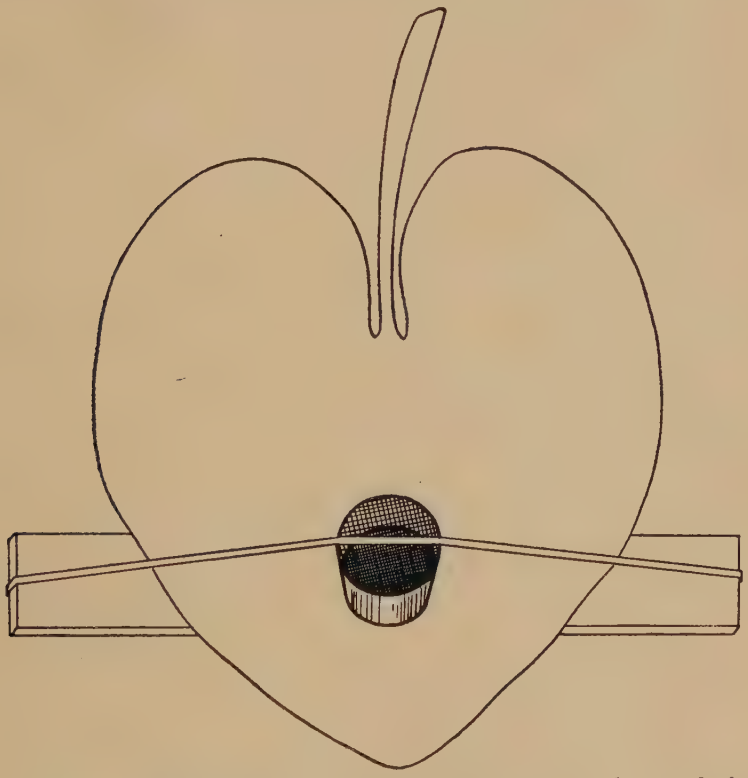

Fig. 1, Diagram illustrating means of holding cage in place on leaf.

board on the under surface and held in position with a rubber band as shown in figure 1. The transparent wall of the cage made it possible to observe aphid activity within the cell and after this was done the cage could be removed and the young or the exuvia could be brushed aside with a camel's-hair brush, if such a procedure was desirable or necessary.

The investigation was conducted in a laboratory in which the

temperature ranged from 70 to 80° F. Some rearing was also done out of doors during the months of December, January, and February where the mean temperature for December was 49.8, for January 53.1, and February 53.2. A single experiment was conducted in a greenhouse where the temperature ranged from 75 to 80° F.

Life History Studies

Length of nymphal period: As soon as the nymphs are born they begin to feed and continue to do so until their development is complete. Twenty-five individuals were reared under laboratory conditions and it was found that the nymphal period ranged from 5 to 7 days with an average of 6.2 days. Ten individuals were reared out of doors under December conditions. Here the range was 15 to 24 days with an average of 17.3 days.

Number of instars: The number of instars under laboratory conditions was studied in 25 wingless and 13 winged individuals. In all cases the wingless individuals moulted 4 times while those with wings moulted 5 times. The number of antennal segments found in the several instars of the wingless form was 4 for the first, 5 in the second and third, 6 in the fourth and 6 in the adult. With the winged form the same condition was encountered and there were 6 segments in the fifth instar and 6 in the adult. Under laboratory conditions moults occurred in from 36 to 40 hours regardless of the instar. Under December out-of-doors conditions the period between moults was 4 to 6 days.

It is difficult to distinguish winged forms during the early instars. Wing pads do not make their appearance until after the third moult, so it is not until the 4th instar that winged and wingless individuals can be easily separated from one another.

Number of Progeny and Longevity of Adult Females: The number of progeny and the length of adult female life was determined for out-of-doors conditions and in a greenhouse. In all cases the females were caged separately and the rate of reproduction observed. Each day the cultures were examined and the young removed. A summary of the results obtained is given in table 1. The length of life and the number of progeny produced was greater under greenhouse conditions than out-of-doors. This is not surprising because it is very possible that the winter temperatures prevailing out-of-doors during the months of December, January

and February were much below the optimum for this insect. The results would certainly indicate that this was the case.

The reproductive potential of the females was greatest during the first 10 days. The average number of young produced per female per day under greenhouse conditions was 4.3 as compared to 2.5 over the entire life. Similar figures for out-of-doors were 2.8 and 2.3.

An experiment was conducted out-of-doors to determine what the total production from a single female might be. In 31 days there were 249 progeny and in 42 days the population had increased to 1,356 individuals. It is believed that under more favorable temperature conditions a much larger population would be encountered.

The reproduction was only by parthenogenesis and no males appeared during the observations.

Production of Winged Forms: The natural factors that stimulate the production of winged forms are not fully known. It is believed by some that the production of winged aphids is a response to increased population density. It is a means that insures survival and dispersal of species. If only wingless individuals were produced indefinitely the population would finally reach a point where the plant would be killed, and the aphid population would die for want of food.

Table 1. Length of adult life and the number of female progeny produced out-of-doors and under greenhouse conditions.

Location	*Number of individuals*	*Length of life in days*		*Number of progeny*	
		range	*average*	*range*	*average*
out of doors[1]	25	10–29	17.6	21–58	41.0
greenhouse	16	16–29	23.8	36–98	59.9

[1] Months of December, January and February.

The production of winged forms may also be brought about by physiological changes in the host which result from heavy feeding by aphids. This has been suggested as a possibility by Goff and Tissot (1932). The growing of plants in nutrient solutions should

aid in determining whether heavy aphid infestations tend to cause physiological changes in the host plants.

As pointed out by Wigglesworth (1950) there are many external factors that influence the production of winged forms. These include the lack of water, proteins and similar substances.

SUMMMARY

Hydroponics were successfully used to grow squash plants upon which ecological studies of the cotton or melon aphid were conducted. Under laboratory conditions (70 to 80° F.) the length of the nymphal period ranged from 5 to 7 days with an average of 6.2 days. Out-of-doors under winter conditions the range was 15 to 24 days with an average of 17.3 days.

It was found that wingless individuals moulted 4 times while those with wings cast their skins 5 times. Wing pads do not make their appearance until after the third moult.

Under greenhouse conditions (75 to 80° F.) the length of adult life averaged 23.8 days, while for winter conditions out-of-doors it was only 17.6 days. The average number of progeny produced under greenhouse conditions was 59.9 while for out-of-doors it was 41.0

Factors that result in the production of winged forms are discussed.

ACKNOWLEDGEMENTS

Thanks are due to Dr. E. G. Linsley, Chairman, and Dr. A. E. Michelbacher of the Department of Entomology and Parasitology, University of California; and to Dr. E. Malavolta, Associate Professor in the School of Agronomy, University of São Paulo, Brazil, and Associate Fellow in the Department of Plant Nutrition, University of California, for help and suggestions received.

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PIT-MAKING PITTOSPORUM SCALE IN WESTERN WASHINGTON

(Homoptera:Coccidae)

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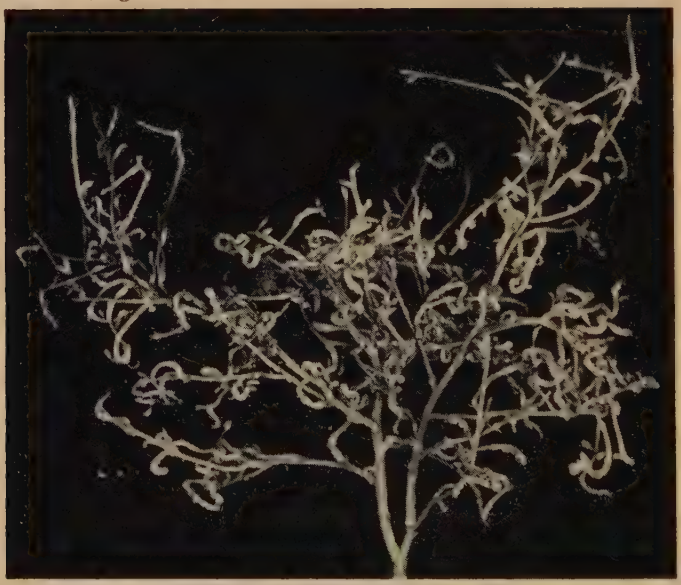
On June 19, 1953, Mr. Sidney Walsh, Landscape Engineer for the Washington State Department of Highways, left some samples of broom at the Western Washington Experiment Station which were infested with a scale insect. Mr. Walsh reported that this scale insect was killing the broom in great quantities where it had been planted to hold the banks of cuts made for U.S. Highway 99, below Fort Lewis. The broom most severely damaged was known as *Genistus (Cytisus) kewensis*. The plants were 10 to 15 years old.

These specimens were sent to Mr. C. F. W. Muesebeck, in charge of the Division of Insect Detection and Identification, Bureau of Entomology and Plant Quarantine, Washington, D. C., with the request that the scale insect be identified. A letter dated July 13, 1953, reports that Miss Louise M. Russell had identified the scale insect as *Asterolecanium arabidis* (Signoret), and the Division of Cereal and Forage Insect Investigations had been notified for possible further attention.

The pit-making pittosporum scale has been a problem in California for some time. According to Essig (1945), the insect is widely distributed in Europe and in the northeastern part of the United States. It is regarded with considerable concern in Cali-

fornia and elswhere because of its serious injuries to many valuable ornamental plants, its rapid adaptation to an ever increasing number of unrelated plants, and its correspondingly widening distribtution.

Like many others, this scale appears to inject a toxin into the host plant which causes cessation of growth, and on many plants distorted, somewhat enlarged and often dead terminals of the branches (Fig. 1)



EXPLANATION OF PLATE

Fig. 1, *Genistus (Cytisus) kewensis* infested with the pit-making pittosporum scale. Note distortions.

An examination of the brooms planted by the Highway Department to hold the sandy banks of the cuts made for U.S. Highway 99 on either side of the Nisqually River showed that the variety *Genistus (Cytisus) kewensis* is the most severely infested and injured. Another horticultural variety of broom is also being injured and killed. However, Scotch broom which has escaped and estblished itself among the infested plants on these same embankments appears to be free of infestation at this time.

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A NEW PERISIEROLA FROM CALIFORNIA

(Hymenoptera:Bethylidae)

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The present species is described at this time so that a name will be available for use by W. H. Wade in his study of the parasites of the larvae of the phycitid moth, *Myelois venipars* Dyar, the navel orangeworm.

Perisierola breviceps Krombein, new species

Female—Length 3.4 mm., forewing 2.2 mm. Black; apex of scape, pedicel, first flagellar segment, tibiae, and tarsi testaceous. Wings clear hyaline; stigma and prostigma dark brown; veins very pale yellowish.

Head scarcely longer than broad, poorly developed behind eyes; distance from posterior margin of head to posterior margin of eyes one-fourth the eye length; clypeus with a strong, arcuate median keel, which extends back on front a short distance beyond antennal insertions; dorsum of head moderately coriaceous and with some scattered punctures; ocelli in a broad triangle, the ocellocular line 1.5 as long as postocellar line; antennae extending back to posterior margin of pronotum. *Thorax* slightly narrower than head; pronotum delicately coriaceous and with a few scattered, small punctures, about 1.5 times as long as scutum; scutum with similar sculpture, a little more than twice as broad as long, the notaulices present though feebly impressed; scutellum about as long as scutum, separated from it by an impressed groove, and feebly coriaceous; dorsum of propodeum strongly coriaceous except for a narrow, slightly elevated, polished strip down middle, the lateral margins strongly carinate, the posterior margin more delicately so, the carina evanescent in middle; posterior surface of propodeum abruptly declivous, flat, and delicately coriaceous; side of pronotum with moderately close, parallel, oblique, fine carinae; mesopleuron delicately coriaceous; side of propodeum strongly coriaceous. *Abdomen* somewhat broader than thorax, as long as head and thorax combined, highly polished. *Stigma* longer than broad; radius a little over twice as long as stigma, moderately curved; median cell with only one or two microtrichiae.

Male. Unknown.

Holotype female, TRACY, SAN JOAQUIN COUNTY, CALIFORNIA, April 29, 1953 (W. H. Wade; reared from *Myelois venipars* Dyar) [U. S. National Museum, Type No. 62241]. *Paratypes.* 2 ♀♀; same data as type [California Insect Survey, University of California, Berkeley]. 1 ♀; same data as type, but July 25, 1953 [U. S. Na-

tional Museum]. The paratypes vary in length from 2.8 to 3.6 mm., and do not differ in any important details of the sculpture.

P. breviceps females are distinguished from those of the other described North American species by the following combination of characters: the strong, arcuate clypeal keel; head poorly developed behind eyes; very broad ocellar triangle; and the almost total absence of microtrichiae in the median cell.

INSECTS IN GRAIN ELEVATORS AT PULLMAN AND ALBION, WASHINGTON[1]

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The twenty-six species of insects given in Table 1 were recorded from three grain elevators at Pullman and Albion, Washington, during the time that experiments on residual sprays were being conducted. Most of these species were taken from the floor samples in empty treated bins. A few were obtained from damp, spilled wheat below the bins.

The granary weevil, the two species of flat grain beetles, the saw-toothed grain beetle and the red flour beetle were most abundant and economically important. Of the 9830 insects recovered, the percentages of these particular insects were 40.5, 26, 22.4, and 11.1 respectively. *Microgramme filiformis* and *Lathridius minutus* are recorded for the first time from granaries in the United States, although they have been reported from other stored food products in several states. *Microgramme filiformis, Trogoderma simplex* and *Alphitophagus bifaciatus* are all new Washington records.[2] *Trogoderma boron*, recently described as new by Beal[3] is the first record of this species' occurrence in elevators from Washington.

Other noteworthy finding are concerned with two species each of *Trogoderma, Tribolium*, and *Laemophloeus*. *Trogoderma simp-*

[1] Work conducted under Project No. 1127.

[2] Personal communications from R. S. Beal, Melville H. Hatch, and Luella M. Walkley.

[3] Beal, R. S., 1954, Biology and taxonomy of the Nearctic species of Trogoderma. Univ. of Calif. Publ. Ent., 10(2) :35-102, 18 figs.

Table 1. Insects in Grain Elevators at Pullman and Albion, Washington, 1952.

COMMON NAME	SCIENTIFIC NAME	FREQUENCY
	COLEOPTERA	
	Curculionidae	
Granary weevil	*Sitophilus granarius*	often
	Tenebrionidae	
Red flour beetle	*Tribolium castaneum*	often
Confused flour beetle	*Tribolium confusum*	rare
Yellow meal worm	*Tenebrio molitor*	common
	Cynaeus angustus	rare
	Cucujidae	
Flat grain beetle	*Laemophloeus pusillus*	often
Flat grain beetle	*Laemophloeus turcicus*	often
Saw-toothed grain beetle	*Oryzaephilus surinamensis*	often
Foreign grain beetle	*Ahasverus advena*	very rare
	Ostomidae	
Cadelle	*Tenebroides mauritanicus*	occasional
	Ptinidae	
White marked spider beetle	*Ptinus fur*	rare
	Dermestidae	
	Trogoderma simplex	common
Black carpet beetle	*Attagenus piceus*	common
	Trogoderma boron	occasional
Larder beetle	*Dermestes lardarius*	rare
	Chrysomelidae	
Two-banded fungus beetle	*Alphitophagus bifasciatus*	rare
	Lathridiidae	
	Microgramme filiformis	occasional
	Lathridius minutus	occasional
	Mycetophagidae	
	Mycetophagus quadriguttatus	rare
	Cryptophagidae	
	Cryptophagus sp. 1	rare
	Cryptophagus sp. 2	rare
	Cryptophagus sp. 3	rare
	LEPIDOPTERA	
	Pyralidae	
Meal moth	*Pyralis farinalis*	common
	Tineidae	
European grain moth	*Nemapogon granella*	common
	DIPTERA	
	Omphralidae	
Window pane fly	*Omphrale fenestralis*	rare
	ACARINA	
	Laelaptidae	
Grain mite	*Haemolaelaps megaventralis*	common

lex appears more frequently and abundantly than *T. boron*. In one elevator at Pullman, this species outnumbered any other insect. In seven bins of this elevator, it varied from 17 to 352, with an average of 116. This insect is also among the five insects recovered from wheat samples for the study of field infestations (Chao and others, 1953). It might be one of the most important secondary insects in elevators in this area. *Tribolium castaneum* was much more abundant than *T. confusum*. However, the reverse should be true according to Good (1936). The two species of *Laemophloeus* occur in similar numbers.

Luella M. Walkley identified *Lathridius minutus* and *Microgramme filiformis*, and supplied the information on their habitats; H. W. Capps identified *Pyralis farinalis* and E. W. Baker, *Hamolaelaps megaventralis*. The identifications of these species were made through the courtesy of C. F. W. Muesebeck. R. S. Beal identified the two species of *Trogoderma* and supplied the information on their distribution. Melville H. Hatch identified *Laemophloeus turcicus* and *Mycetophagus quadriguttatus* and supplied the information on the distribution of *Alphitophagus bifaciatus*. Maurice T. James identified *Omphrale fenestralis*. H. S. Telford assisted in preparing the manuscript.

To all the men mentioned above, the writer is grateful.

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BOOK NOTICE

THE GRASSHOPPERS AND LOCUSTS (ACRIDOIDEA) OF AUSTRALIA. Volume 2: Family Acrididae (Subfamily Pyrgomorphinae). By James A. G. Rehn. Melbourne, July 1953. 270 pp., 32 pls. Price £ 2, plus 3/10 postage. (Order from Tait Book Co., Pty. Ltd., 349 Collins St., Melbourne, Vic., Australia.)

The first volume of this series was noted in the January, 1953 *Pan-Pacific Entomologist*; the second is of similar format. The descriptions are full, those of higher categories having much on probable phylogenies. Most of the less known place names are documented in footnotes. The photographs of specimens are remarkably good, and very well reproduced. There are two new generic, three subgeneric, 15 specific and six subspecific names proposed. —HUGH B. LEECH.

A NOTE ON THE NESTING HABITS OF EXOMALOPSIS SOLANI COCKERELL

(Hymenoptera, Anthophoridae)[1]

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The tribe Exomalopsini is of particular interest to students of bees because of an apparently close morphological relationship to to parasitic bees of the Nomadini. Two genera occur in the United States, *Exomalopsis* and *Ancyloscelis*, but with the exception of an observation by Hicks (1936) apparently the nesting habits of our species have not been described. Hicks reported as follows: "Some notes on the habits of the rare bee, *Exomalopsis torticornis* Ckll. (det. Cockerell), were taken on June 24, 1926 at Los Angeles, California. Four pollen laden females were seen, within a few minuts, entering a common nest entrance into the ground. Each came out, in turn, after depositing the provisions and was caught at that time. The nest was next dug out. The tunnel leading from the entrance was in very dry and in exceedingly hard soil. These conditions made it difficult to follow in digging, although I was able to trace its course for a few inches. It extended straight into the earth for one inch, then turned to one side for one and one-half inches where it again continued straight down for two inches. The continuation at this point was lost but not until it had been definitely shown that there was one tunnel and that all the bees were using it. The nests may or may not have been separate. This important point needs further investigation."

Claude-Joseph (1926) found individuals of *Exomalopsis caerulea* Friese in Chile using a common nest entrance but preparing separate galleries. Each bee provisions a linear series of three to six cells at an average depth of 20 cm. The jug-shaped cells are smooth and varnished interiorly and are closed by a thick clay cap. The egg is placed on top of the moistened pollen ball. The larva consumes the pollen ball in about six weeks and over-winters in a coriaceous cocoon.

During the second week of August, 1954, in an area nine miles southwest of Fresnillo, Zacatecas, Mexico, where anthophorid bees

[1] The observations reported here are part of a series of studies made possible by a grant-in-aid from the Associates in Tropical Biogeography, University of California.

(Diadasia, Emphor, Melissodes, Anthophora, Tetralonia, and *Hemisia)* were nesting abundantly, a few females of *Exomalopsis solani* Cockerell were observed taking pollen from flowers of *Solanum eleagnifolium* Cav. Although this area was carefully searched and bees intensely studied for a week, no *Exomalopsis* nesting sites were discovered. One female was captured while entering an abandond burrow of *Emphor bombiformis* (Cresson), but because of the large diameter of the burrow the association was considered accidental and no particular signficance was attached to the observation. Later, however, another observation was made in connection with a bee burrow which had been "pointed out" to us by a parasitic female of the genus *Nomada (Micronomada)* which clearly indicated that it was a known host burrow. The *Nomada* was captured and two days later the burrow was excavated. The entrance to this burrow was at the bottom of a shallow cavity in the soil and the shaft proceeded directly downward for fourteen and one-half centimeters and then turned abruptly on the horizontal for three centimeters. At the end of the burrow a worn female of *Exomalopsis solani* was apparently digging. With the assistance of another female *Nomada* a second nest of this type was located and determined to be that of *Agapostemon texanus* Cresson. Thus the *Exomalopsis* had apparently appropriated an abandoned (or perhaps active) *Agapostemon* burrow.

Although our very limited observations can be regarded as little more than suggestive, it does appear possible that *Exomalopsis solani* regularly appropriates abandoned (perhaps also active) burrows of various genera of bees. If this proves to be true it permits speculation as to the origin of a parasitic habit in this group of bees which might have given rise to the related Nomadini. *Exomalopsis caerulea* and *E. torticornis* are in different species groups or subgenera from *E. solani (Exomalopsis s. str.)*.

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